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ABSTRACT

Forty-three children, 2;11 to 5;6, described six familiar activities: making cookies, going to the grocery, having a birthday party, going to a restaurant, getting dressed, and having a fire drill. They described each event three times. The descriptions were elicited by initially asking "What happens when...?" or "What do you do when...?" and then providing non-directive probes such as "Can you tell me more?" and "Anything else?" Reviews of the children's descriptions indicate that the request for description of events divorced from the immediate context elicits a sophistication in temporal structure and relational vocabulary that is often not accessed in either experimental or free-play settings with preschoolers. Performance in such settings can considerably expand what is known about preschoolers' cognitive and linguistic abilities. The baseline competency demonstrated in these settings can provide the foundation for more controlled research that attempts to establish how experimentally based competency gradually develops into the more abstract, decontextualized knowledge that characterizes adults' understanding of relational terms. (Author/JK)

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Temporal Knowledge Expressed in Preschoolers' Descriptions of Familiar Activities

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Forty-three children, 2;11 to 5;6, described six familiar activities: making cookies, going to the grocery, having a birthday party, going to a restaurant, getting dressed, and having a fire drill. They described each event three times. The descriptions were elicitied by initially asking "What happens when...?" or "What do you do when...?" and then providing non-directive probes such as "Can you tell me more?" and "Anything else?" Table 1 shows examples of the protocols obtained using this procedure.

That children as young as three can give such descriptions at all conflicts with the common assumption that preschoolers' speech is constrained by the immediate context. Given the pervasive assumption that preschoolers experience difficulty in generalization, it is also somewhat surprising that the subjects tended to talk about "what happens" in general rather than about "what happened on a particular occasion." In this regard, it is particularly noteworthy that even the youngest subjects' descriptions are timeless. That is, events were not referenced in terms of a particular moment in time. Subjects were far more likely to say something like "You eat cake at birthday parties" than to say "I ate cake at my last party." Although in accord with the generalized nature of the accounts, such timeless statements are of particular interest since an analysis of the temporal speech used by Adam and Sarah in free-play settings found that timeless speech did not appear until about age four (Cromer, 1968). Both Cromer (1968) and McNeill (1979) interpreted the relatively late appearance of timeless speech in terms of immature cognitive level limiting grammatical development, and argued that it is not until about four that the child attains a level of cognitive development that permits the decentration necessary for timeless expression. Our data indicate that children control this form of expression, and therefore must have whatever cognitive abilities underlie it, at least as early as their third birthday. It appears that different discourse settings are differentially effective in tapping particular competencies; whereas there may be little need to use timeless speech in play settings, such speech is highly appropriate and even necessary in the context of describing routine activities. This is the only case we know of in which <u>increasing</u> the abstractness of task demands has resulted in <u>lowering</u> the age at which competency in a particular domain can be demonstrated!

The six activities all possess some degree of inherent temporal structure, and the assumption that children are familiar with the activities suggests that they might also understand and express their temporal organization. This expectation conflicts with prior

TABLE 1

Sample Protocols

Cookies S#1, 2;11	(Do you make cookies with your mommy sometimes? What do you do?) I help her. (You help her make them? How do you do that?) My mommy says I'm a good helper. (How do you help your mommy?) First she gots the things out she needs. (First she gets out the things she needs?) Yeah. She gots something out to bake muffins with. But first she has to buy some things for muffins.
Restaurant S#2, 2;11	(Tell me what you do at a restaurant.) You drink and you eat. (Anything else you can think of? You eat and you drink...) -- S shakes head 'no' --
Fire Drill S#7, 3;5	(What do you do when you have a fire drill at school?) You run outside. (Run outside?) And go to another building. (Um-hum. And what else do you do? Anything else?) Come back.
Dressing S#11, 3;9	(What happens when you get dressed in the morning?) You go outside and play. (Uh-huh. Can you tell me about getting dressed?) When you get dressed in your short-sleeved shirt and you don't put something on that has a long-sleeved part, then you get cold. (What else can you tell me about getting dressed in the morning? You fish. I have two swimming pools, but one of them broke and I bought a new one.
Birthday S#42, 5;6	Well, when you have a birthday, ya get up early in the morning, get dressed, and you go to the birthday party, and um, you--and you get a hat at the birthday party, and you play games, and when the cake's ready, you sit down and you get a piece and you eat it up, and then when it's time to go, you go!
Grocery S#43, 5;6	(Can you tell me about going to the grocery store?) Yes, it'll be about when I go to Pathmark. I, my, when I first arrive I go get a toy from a machine, then I go looking around at toys and every item. I look at, I look for my mother then I, sometimes I buy an extra toy, I did the one time I went to Pathmark, and also, my mother and father do all the other work.

TABLE 2

Temporal Repairs

S#1, 2;11	*She gots something out to bake muffins with. But first she has to buy some things for muffins.
S#8, 3;7	When I finish, I go to sleep. Eat the green part (icing) first.
S#17, 4;1	You know what I do is, I just blow off the candles and eat it. And before I eat it, I just take out all the candles.
S#17, 4;1	*Nothing but 'cept blow out the candles. I eat cake, but before of course, I got to take them all out.
S#24, 4;7	*Make the dough. And then you put it in the oven. But before you put it in the oven, you make the cookie shapes and then you put it in the oven. And then when the bell rings, you take out the cookies.
S#24, 4;7	*I---I don't remember. I---put on the clothes I wanna wear. And I, but before that I watch my favorite program, Captain Kangaroo. That's all I do.
S#24, 4;7	And um, the person will open it. And take off, take off the ribbon before they open it, and they'll find out what's inside.
S#25, 4;7	Sit down, and eat, eat supper. Pay, go home. First, buy a piece of cake and then go home. Go to bed. And then go to sleep.
S#38, 5;4	Mix dough. And then you pop it in the oven, like Patty Cake, Patty Cake, (etc.). You get the dough, pop it in the oven, and first you roll it, then you pop it in the oven. No, I mean, first cookie, first make the dough, flatten it, and then put the cookie cutters out and then press them down...
S#38, 5;4	*You--you can--you sit down and eat ice cream, but first what you do is really play and then eat ice cream and cake. And then you go home.
S#38, 5;4	*You make the dough, eat them, but only when they're baked.
S#41, 5;6	You go outside and go down the staircase fast and don't talk, and then go outside, either down the fire escape or down the front hall. Or--or--and go outside and wait for the firemen, and, and first you try the fire extinguishers. First you have to get all the fire extinguishers out and bring 'em out, right? Because, so you can get it from outside.

* These repairs are introduced by but, an adversative connective indicating that what follows might not be expected on the basis of what preceded. It is highly appropriate in this context since it is ordinarily unexpected that discourse "goes backwards."

literature however. Piaget (1971/1927) has claimed that preoperational children are incapable of constructing temporal sequences because such construction depends upon reversible operations. Similarly, Fraisse (1963) has claimed that the young child has difficulty with sequencing because "the memories of young children are completely jumbled up, for they have not learned to reconstruct their past... (p.254)." Although Brown (1975) found that preschoolers were able to recognize and reconstruct previously seen temporal sequences, the same children were unable to recall those sequences, suggesting that difficulty in complying with the demands of an expository task might mask underlying sensitivity to temporal relationships.

Thus there were several reasons to suspect that our subjects might randomly order the events constituting the activities they described. This was not the case. Younger subjects mentioned fewer events than older subjects, which allowed less opportunity for the imposition of temporal structure, and the activities varied in terms of degree of temporal structure. Reading through the protocols, it was clear that within these constraints, virtually all the subjects were sensitive to temporal structure. To substantiate this impression, the temporal ordering of events reported by subjects the second time they described going to a restaurant was considered closely. In this subsample of the data, 62% of the subjects gave responses that included at least two events having an invariant "real-world" order. The correct sequence of ordered events was violated in only three cases; in these cases the misordered event was reported twice, first in an incorrect and then in the correct position. For example, one subject said "You just sit, you come in and sit down." In these cases of dual mention, it seems clear that subjects were aware of the correct sequence and were making non-explicit corrections of their errors. In contrast to these three "errors" there were 83 cases, consisting of 109 events, in which event pairs having a "real world" invariant order were correctly sequenced. The probability of this occurring by chance is miniscule and the data offer clear evidence that subjects were sensitive to the temporal structure of the activities. We also looked at the other protocols of subjects not showing sensitivity to temporal invariants in their restaurant time-two descriptions, and found that 41 of the 43 subjects showed sensitivity to temporal invariants in at least some of their descriptions. All protocols of the subjects were scrutinized for evidence of violations of temporal invariants; there were very few of these and most were implicitly corrected as in the example given above, or were expressions such as "I put on my shoes and socks", a logically reversed but conventional ordering. The final question addressed within this subsample of the data concerned the manner in which subjects indicated temporal sequence. The term and was the most frequent means of linkage; and then and then were also common, as was simple juxtaposition without a linguistic link. Other means of linkage included when, if, so, after, and first, all used appropriately. In short, preschoolers are not only

capable of expressing temporal sequence, but also control a variety of ways of doing so.

Two protocols will provide the general flavor of these data. The first is by the youngest subject (3;1) whose description included temporal structure: "Well, you eat and then go somewhere." The other protocol, produced by a child 4;7, contains the most elaborated temporal structure in the subsample of data; nine events are mentioned, of which eight were judged to be temporal invariants and one to be an implicitly corrected reversal.

> (Tell me what you do at a restaurant.) You just sit, you come in and sit down. And a waiter comes along. And just, and you order your food. (So you order your food. What else happens?) And then the waiter comes back with your food and you eat it. (OK, you eat your food and what else happens?) -- No reply -- (Anything else?) You pay and then you go out.

At one level, these data are extremely mundane, and, in large quantity, also extremely boring! But at another level, appreciated only in the context of prior research and speculation concerning preschoolers' sensitivity to temporal relationships, they are very exciting and require that we reconceptualize our notions of the development of temporal knowledge. It is particularly noteworthy that the data were obtained in the context of an expository task and in the absence of the sorts of external prompts used in previous studies. It appears that preschoolers are able to abstract temporal sequences on the basis of personally experienced events, to represent such sequences internally, and to reconstruct them on demand. Both the ease with which their knowledge of the temporal structure of familiar activities may be accessed and the fact that they have acquired a variety of means for expressing succession would seem to indicate the psychological reality that temporal relationships assume for the young child. All these points argue against earlier claims that the reconstruction of temporal succession is necessarily beyond the competency of the preoperational child.

One other aspect of the temporal structure of the descriptions that is particularly interesting in relation to Piagetian theory concerns the rule of discourse specifying that the order of mention of a series of events should ordinarily be congruent with their order of occurrence. In reporting a series, a speaker may "error" and omit an event from its correct position in a sequence. Since it is not appropriate to simply mention the event at the time the omission is noted, the speaker must somehow indicate where this event fits into the temporal structure of his description. Earlier we mentioned some "implicit" temporal repairs; here our concern is with explicit temporal repairs. Examples of these are given in Table 2. Such repairs are extremely important because there appears to be

no way of accounting for them other than to assume that the speaker has an internal representation of the temporal sequence and is able to move bi-directionally within that sequence. Taken together, these two abilities seem to meet the requirements for temporal reversibility established by Piaget (1971/1927) and Ferreiro and Sinclair (1971), and therefore would not be expected to be within children's competence until the onset of concrete operations at about age seven.

There is no evidence that the subjects responsible for these temporal repairs were extraordinarily precocious, and we seriously doubt that they would have shown reversibility on either classic conservation tasks or on the psycholinguistic tasks Ferreiro and Sinclair (1971) used to assess temporal reversibility. Nevertheless, the question remains of what to make of the fact that these very young children are apparently capable of constructing an internal representation of temporal order and moving backwards and forwards within it. While the data indicate that the ability to represent and move bi-directionally within a temporal sequence exists at a much younger age than has been demonstrated in previous research, it seems very likely, since it has remained undetected for so long, that such competency is highly domain specific. That is, it may initially be limited to personally experienced, familiar events, and not readily transfered to unfamiliar, experimenter-imposed stimuli. Another way of saying this is that the temporal reversibility these subjects exhibited may be experientially rather than logically determined. Such abilities would presumably be a necessary precursor of, but not identical with, reversibility as defined in the Piagetian tradition.

Thus far, our focus has been at a macro-level, on the overall temporal structure of the descriptions; the remaining discussion will focus at a more micro-level, on particular vocabulary items. The children used a number of terms whose function is almost exclusively to express temporal relationships, such as first, then, before, after, and when. They also used other connectives such as if, because, and so whose meanings include a temporal component.

Since a great deal of empirical work has addressed preschoolers' comprehension of before and after, it is interesting to consider how these terms were used. Sentences containing before or after may take four different surface forms to express the same temporal relationship. These different forms, illustrated in Table 3, are determined by which term is used and whether the order of mention of the two clauses preserves or violates the actual order of occurrence of the events. All four forms appeared in the protocols, but as Table 4 shows, the frequency of occurrence was rather skewed.

TABLE 3

Four Types of Before/After Sentences

	Before	After
Preserve	X before Y	After X, Y
Violate	Before Y, X	Y after X

TABLE 4

Frequency of Sentence Types

	Before	After
Preserve	3	19
Violate	4	4

Does this differential frequency reflect something like "ease of acquisition" of the various forms, or is there some other way of accounting for this pattern? Although these terms enable circumvention of the rule that order of mention should reflect order of occurrence, it appears that within the context of describing event sequences, this rule is generally followed even when these terms are used. This accounts for the greater frequency of the preserve forms, but does not explain why the after-preserve form outnumbers the before-preserve form by about six to one. This can be explained, at least in part, by the fact that before- and after-sentences differ in terms of which event is subordinated. The first event is subordinated in after-sentences, and the second event in before-sentences. Within cohesive discourse, in contrast to decontextualized experimental stimuli, it is generally the case that given information is presented in the subordinate clause and new information in the main clause. Since subjects' reports ordinarily followed the order of occurrence, a prior event was more likely to be "given" than a subsequent event, and therefore after-preserve sentences tended to be more appropriate than before-preserve sentences. Consideration of sentence content showed that the subordinate clause of seventeen of the nineteen after-preserve sentences contained previously mentioned information. The occasional uses of the other sentence forms likewise occurred in contexts in which they were most appropriate given constraints determined by which event was more appropriately subordinated; for example, all before-violate sentences involved temporal repairs, as in "The person will open it, and take off the ribbon before they open it, and they'll find out what's inside."

This consideration of the differences in the frequency and context of occurrence of the four surface forms for expressing the same temporal relationship indicates that these forms are not functionally equivalent for the preschooler, just as they are not for the adult. The greater frequency of the after-preserve form cannot be taken as indicating that this is the best known or easiest form for these subjects. Rather, it seems more likely that it is most frequently the most appropriate means of expressing

the intended meaning in the discourse setting in which these data were collected. In total, nineteen of the 43 subjects, ranging in age from 3;1 to 5;6, used before or after or both appropriately. Except for one inappropriate use by a twentieth subject, subjects did not misuse before to mean after or vice versa, and the terms were always used to relate sequentially ordered rather than simultaneously occurring events. The competency exhibited in the spontaneous productions of these terms contrasts sharply with the poor comprehension of the terms which preschoolers have exhibited in a number of prior studies. We will speculate on why this might be the case after outlining some parallel discrepancies between accurate use of the terms because, so, and if in our data and demonstrations in other studies that preschoolers do not comprehend these terms.

Because, so and if relate antecedent and consequent clauses. They have a contingency component in that the events in the two clauses must be meaningfully related to one another. They also have an order component in that it matters which clause is introduced by the relational term. Because and if must introduce antecedent clauses and so must introduce consequent clauses. Emerson (1979; 1980) has explored children's comprehension of sentences containing because and if using a grammaticality judgment paradigm and found that sensitivity to the contingency component did not develop until about age five, and sensitivity to the order component did not develop until about age eight. These findings suggest that preschoolers' spontaneous productions of sentences containing these terms might contain contingent clauses, but that the terms would introduce the appropriate clause with approximately chance frequency. Again, this prediction which would be made on the basis of earlier research was not supported. Leaving aside "false starts", that is, cases in which subjects failed to complete sentence fragments, because was used in 16 cases and if in 44 cases. So was used in a causal context 19 times. Subjects using these terms ranged from 3;9 to 5;6 and made no errors with either the contingency or order components of these connectives. While this finding conflicts with the predictions which might be made on the basis of Emerson's data, it is in accord with other studies that have considered preschoolers' spontaneous productions of causal terms (Hood & Bloom, 1979; Eisenberg, 1980).

Why should preschoolers use various relational terms competently in their own speech but appear incompetent when placed in laboratory experiments designed to tap comprehension of these same terms? Finding the answer, or answers, to this question is crucial both for understanding the early acquisition of logical awareness and for methodological reasons. In terms of methodology, it seems very likely that experimenters are not measuring

what they intend to measure if they find preschoolers to be incompetent in areas in which more naturalistic measures show them to be quite competent. We are currently carrying out experiments that we hope will enable us to account for the disparity between the levels of understanding of relational terms that preschoolers demonstrate in their spontaneous speech and in experimental assessments of comprehension. While we have no definitive answers yet, there are several factors that we feel may be contributing to the differences in competency demonstrated in the two contexts.

First, it is possible that preschoolers either fail to understand or fail to accept the task demands posed in experimental settings (Gelman, 1978; DeLoache, 1981). In either case, their performance will provide a poor reflection of their underlying competence. Second, it is possible that some experimental paradigms, particularly grammaticality judgment paradigms, actually test metalinguistic skills rather than simply comprehension of particular connectives. The ability to evaluate language, that is, to treat it as an "object of knowing" must develop later than simply "knowing" language. Third, it is possible, as Kuczaj and Daly (1979) have suggested in a somewhat different context, that preschoolers have more difficulty in decoding someone else's presuppositional framework than in expressing their own. Finally, it is possible that initially the comprehension and production of relational terms is only possible <u>when the relationship is already understood</u>. That is, perhaps relational terms can be used to express what is already known considerably earlier than they can be understood as being abstract terms which <u>establish</u> a relationship. If true, this would account for both the apparent ease with which preschoolers use relational terms in their own speech and the difficulty they experience when their understanding of these terms is assessed in experimental settings. Some recently collected data (Carni & French, in preparation) are in accord with this latter possibility.

In summary, we have found that the request for descriptions of events divorced from the immediate context elicits a sophistication in temporal structure and relational vocabulary that is often not accessed in either experimental or free-play settings with preschoolers. It appears that performance in such a setting can considerably expand what we know about preschoolers' cognitive and linguistic abilities. In addition, the baseline competency demonstrated in such settings can provide the foundation for more controlled research that attempts to establish how such experientially based competency gradually develops into the more abstract, decontextualized knowledge that characterizes adults' understanding of relational terms.

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